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(71) Applicant(s)
Balmoral Group Limited

(Incorporated in the United Kingdom)

Balmoral Park, LOIRSTON, Aberdeenshire, AB9 2BY, United Kingdom

(72) Inventor(s)
Robin Wolfendale
Alan John Grant
Julian Robert Lowe
Neil Steven Appleton

(74) Agent and/or Address for Service
Brookes & Martin
High Holborn House, 52-54 High Holborn, LONDON, WC1V 6SE, United Kingdom

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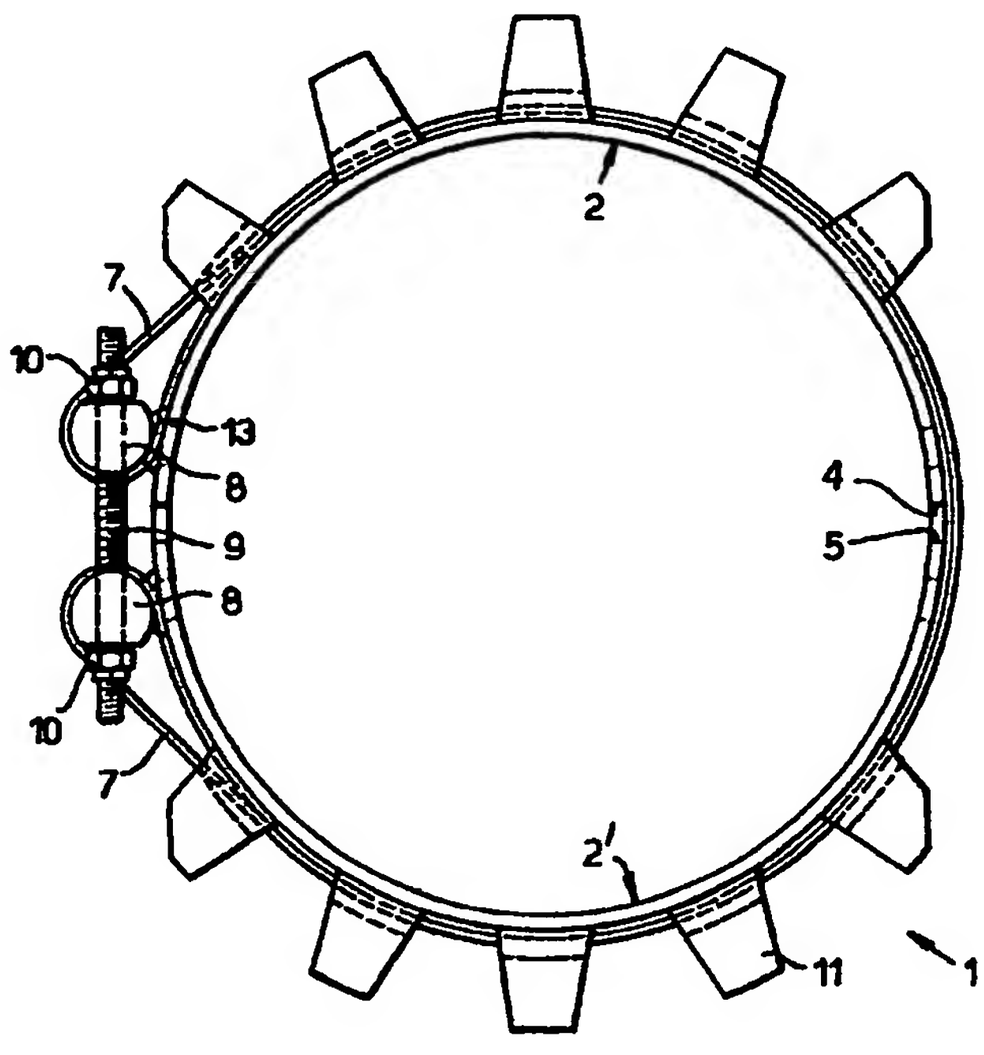
(54) Support for a pipe

(57) A clamp 1 for clamping buoyancy elements to a riser pipe comprises a pair of resilient half shells 2 formed from glass reinforced plastic clamped to the pipe by a titanium or aramid strap 7 or by studding (9, figure 6). The abutting faces of the two half shells 2 are castellated to aid location (figure 7). The half shells 2 have longitudinal ridges 11 onto which buoyancy elements can be mounted. The stress on the buoyancy is thereby reduced. The inner surface of the half shells 2 may have grooves in the form of a helical thread to grip the pipe.

Fig.1.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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Fig.1.

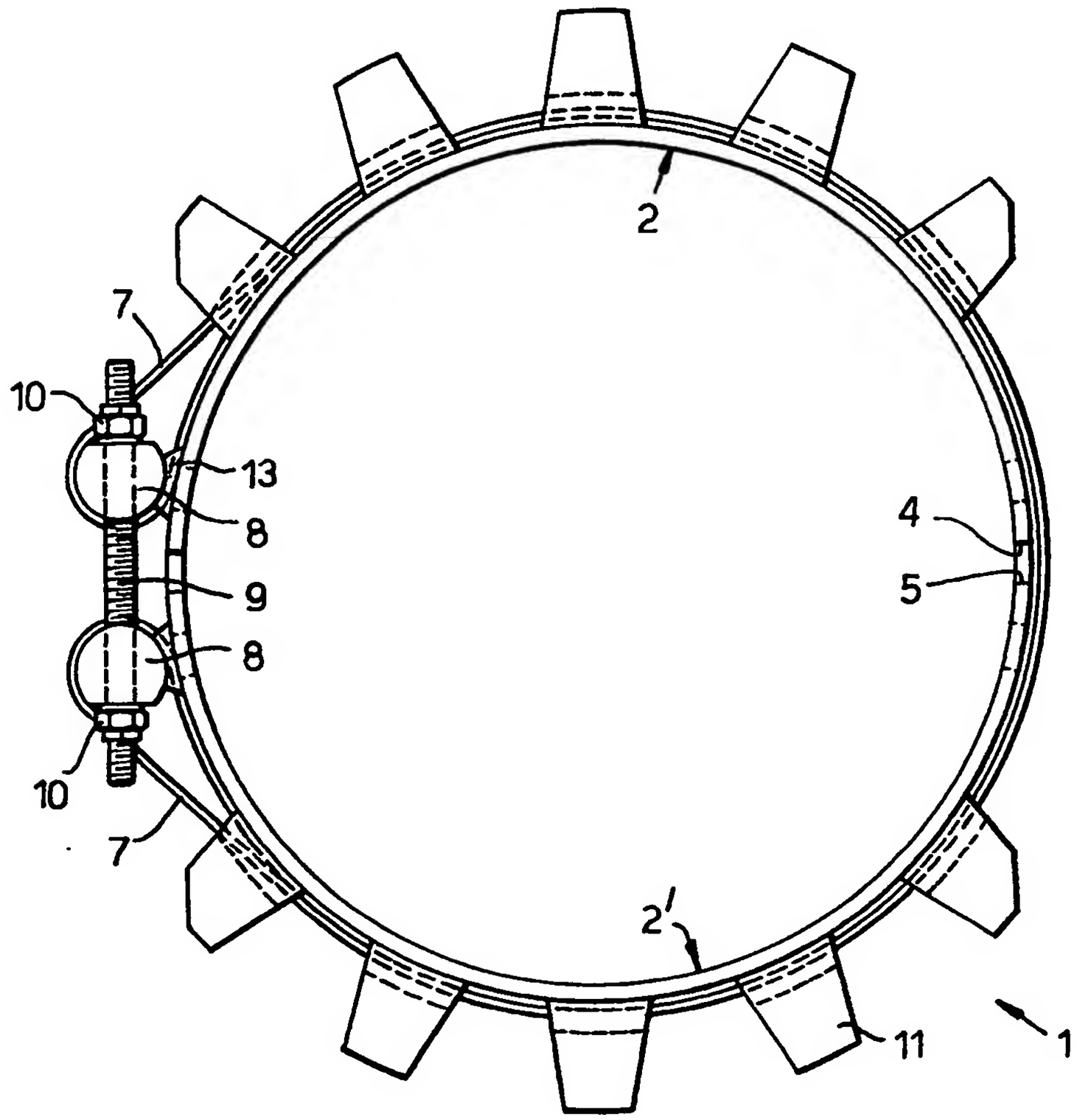


Fig.4.

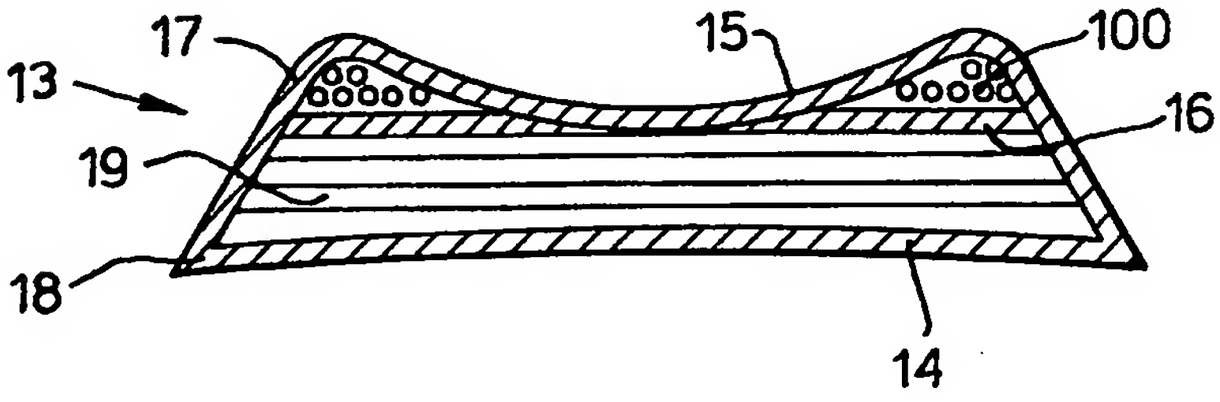


Fig.2.

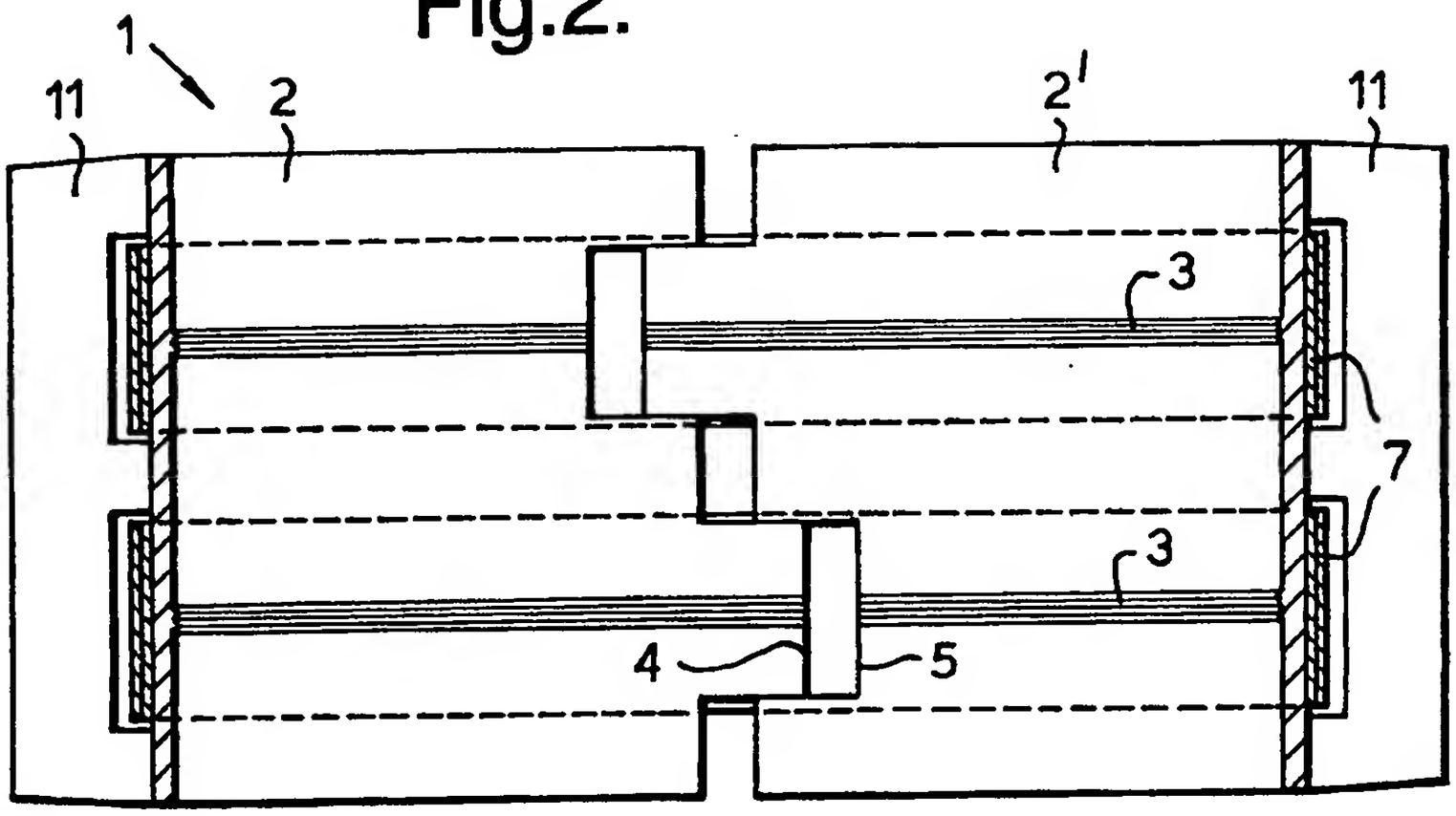


Fig.3.

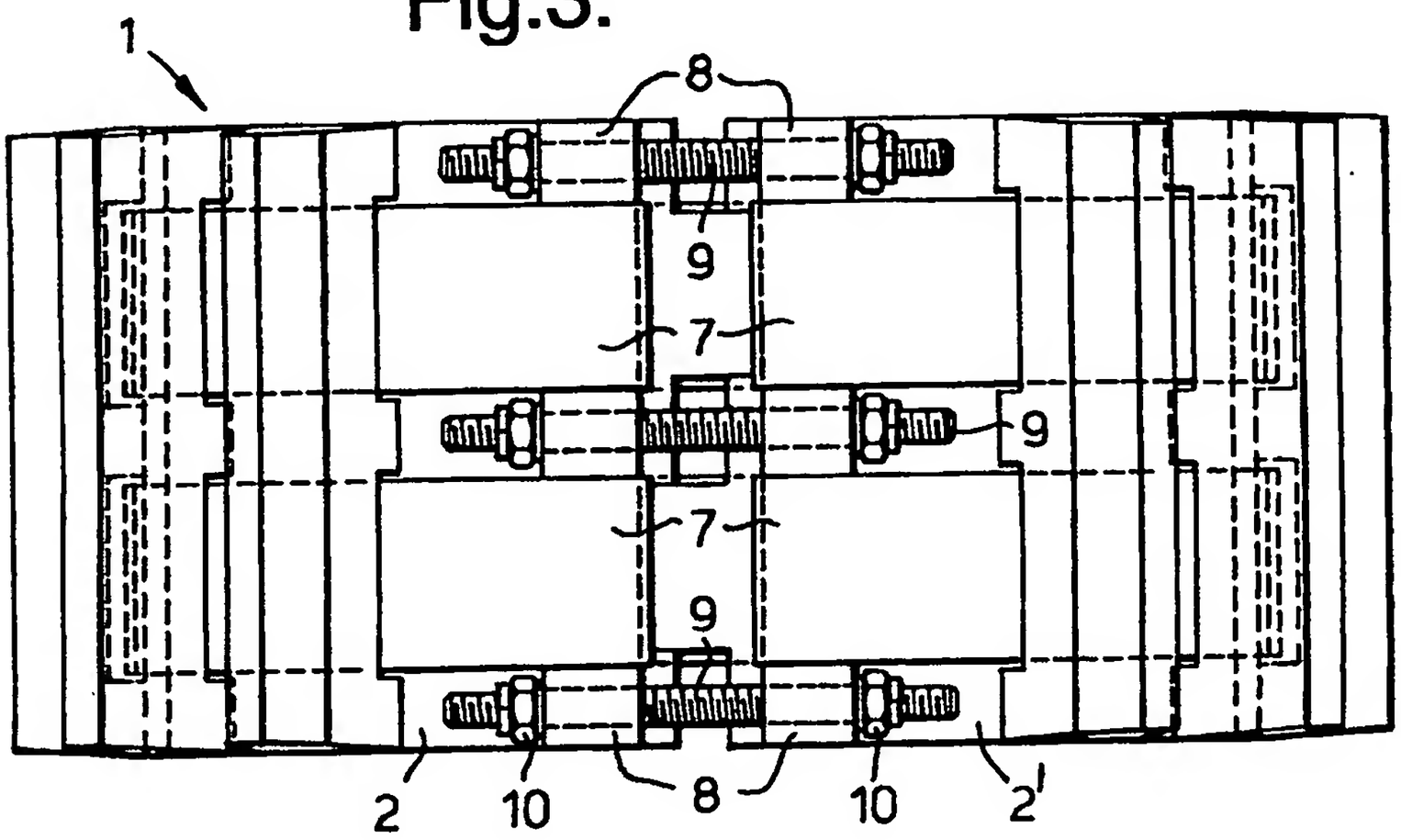


Fig.5.

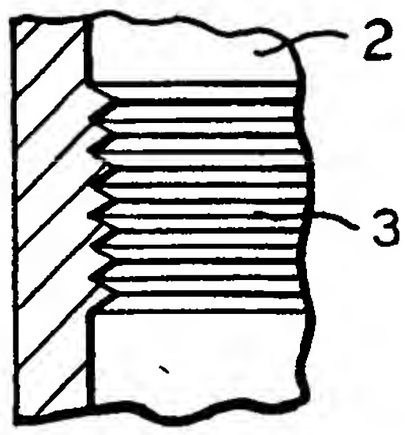


Fig.6.

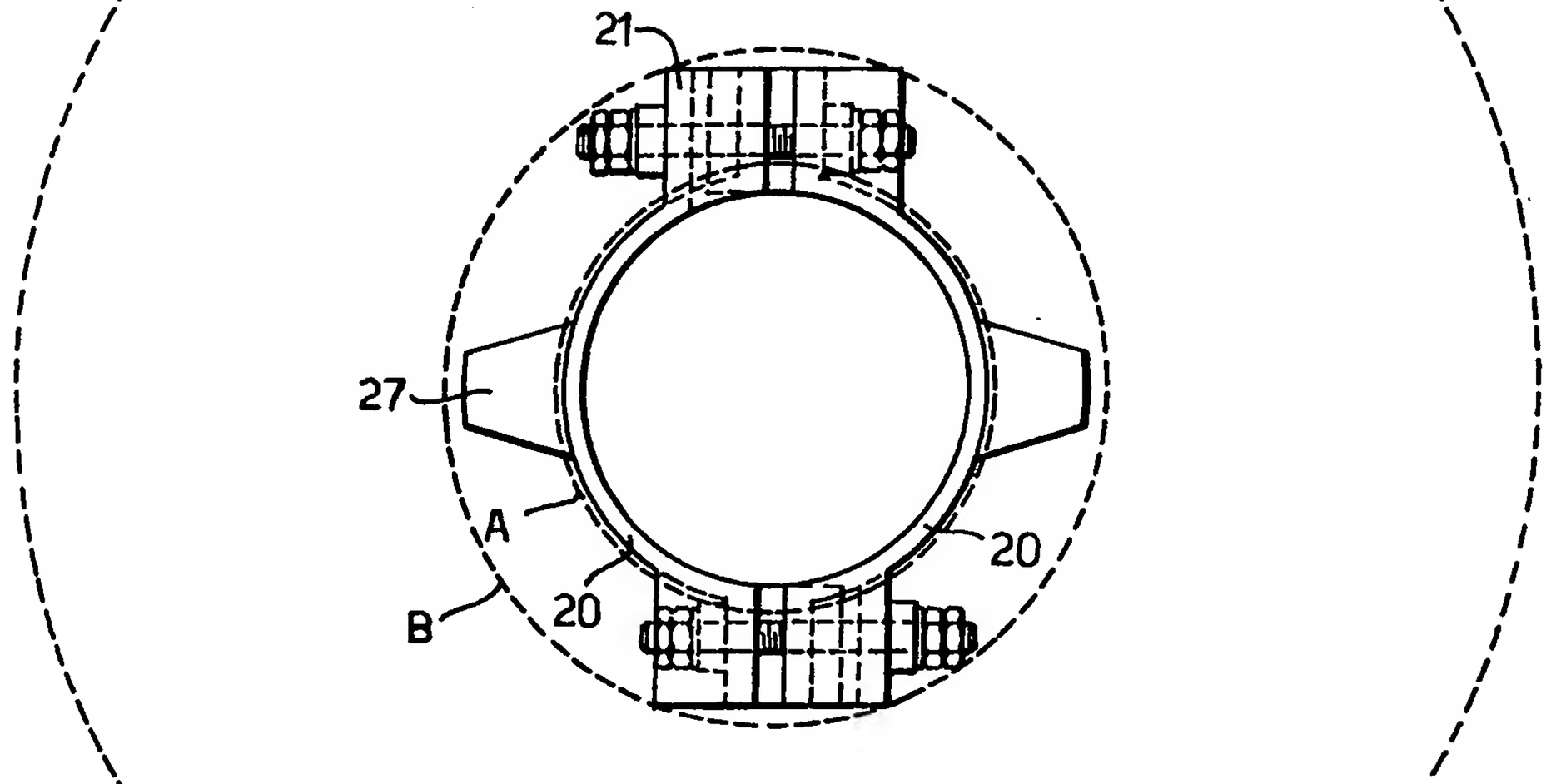


Fig.7.

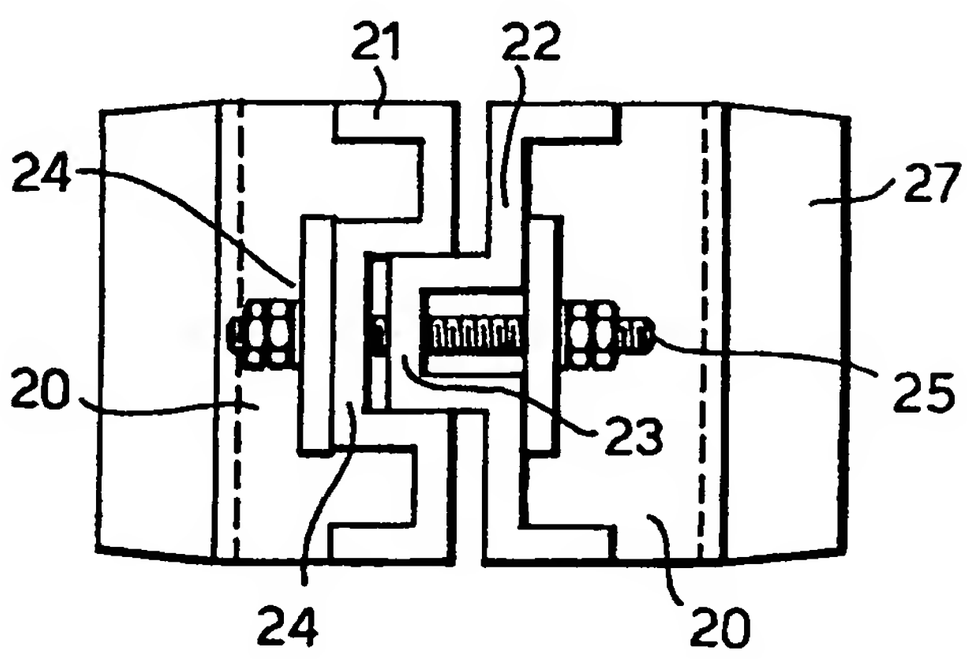
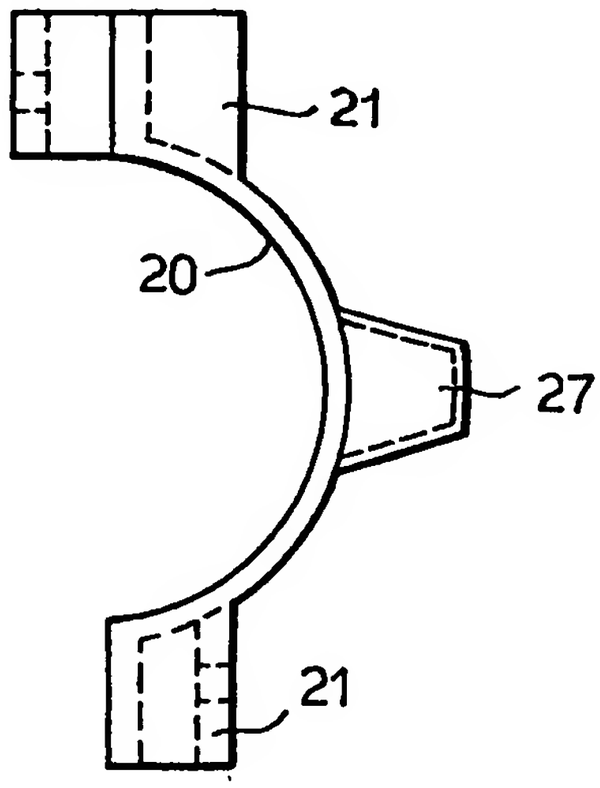


Fig.8.



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SUPPORT FOR A PIPE

This invention relates to a support for a pipe. More especially but by no means exclusively the invention relates to supports for mounting a buoyancy element to a subsea riser.

Pipes, especially subsea pipes for hydrocarbons are commonly provided with outer jackets. The jackets may provide thermal insulation or in the case of risers they may provide buoyancy. It can be difficult to mount the jacket on to the pipe.

One known method of mounting buoyancy on a riser comprises bolting a buoyancy element halves mounted on a liner to the riser. This method suffers from problems. In some variants the buoyancy complete with liner is bolted over the riser. The buoyancy can thus be subject to high levels of stress. Furthermore where the liner is closely configured to the riser it may be necessary to machine the liner to accommodate the particular riser since the risers tend to vary about a nominal size by up to about 15mm.

The invention seeks to reduce the problems associated with the prior art.

According to the invention there is provided a support for mounting an item on a pipe the support comprising a sleeve of adjustable internal diameter for securing to the pipe and a retainer for retaining the item to the support.

Embodiments of the invention will be illustrated by way of example only by reference to the accompanying figures of which

Figure 1 is an elevation of a support of the invention;

Figure 2 is a cross-section of the embodiment of Figure 1;

Figure 3 is a side elevation of the embodiment of Figure 1;

Figure 4 is a cross sectional view of a foot

Figure 5 is a detail view of the internal surface of the embodiment of Figure 1;

Figure 6 is an elevation of a further embodiment with a buoyancy module;

Figure 7 is a side elevation of the embodiment of Figure 6;

Figure 8 is a view of a half shell of the embodiment of Figure 6.

The support 1 of the embodiment of Figure 1 comprises two half shells 2, 2'. Preferably the half shells comprise fibre reinforced plastics material especially glass reinforced resin. The resin is preferably an epoxy vinyl resin. This is preferred for several reasons. First while having good local bearing strength the plastics material is not completely rigid and is thus capable of conforming to the riser and to accommodate small change in diameter. Recently concern has been expressed about the use of some aluminium alloys in sea water. Resin reinforced plastics are generally corrosion resilient. Thirdly resin reinforced plastics materials are less expensive than most corrosion resilient alloys.

It is by no means essential that two half shells be provided. If desired for example a slotted one piece cylinder could be employed although it would generally be necessary to feed the support over a free end of the pipe. Alternatively three or more sections would be provided. In general two sections are preferred.

If wished it is possible to articulate the sections for example with a laterally extending hinge. Normally however there is little continuing need to fasten and unfasten the support and hence the extra expense of a hinge may not be justifiable.

In preferred embodiments of the invention the internal surface of the support is provided with friction grooves 3. Preferably the friction grooves comprise a screw thread. The grooves are often generally quite small. For example in an embodiment of the invention for fitting to a riser of 0.52m the

friction grooves may be of 1.5mm pitch and peak to trough height of 1mm. The friction grooves may cover all or a part of the internal surface.

To assist the conformation of the support to the riser the sleeve may be quite thin. For example in the support illustrated in Figure 1 and intended to fit a 0.52m diameter riser the sleeve may be 10mm thick.

In general a gap will be present between a first edge 4 and a second edge 5 of the support. If desired the gap may be linear but it is prepared that the gap be staggered for example castellated as shown in Figure 2.

The support is clamped to a riser. In the embodiment of Figure 1 the clamp comprises a continuous band 7 of high tensile strength material preferably **KEVLAR** or titanium other materials are however suitable. An axis bar 8 is passed through each end of the band 7 broadly parallel to the longitudinal axis of the riser. The axis bar 8 like the band 7 may need to withstand high loads and is therefore preferably made a high tensile material. Preferably a high tensile strength corrosion resistant steel such as **ZERON** 100 is used. Studding 9 passes through the axis bars 8. Screw fasteners 10 are carried on the studding 9. Movement of the screw fasteners changes the length on the band, axis bar and studding combination and thus allows the support to be clamped more or less securely to the riser. The support conforms to the riser reducing local load concentrations. Risers tend to vary in size from a nominal. Because the support of the invention has a degree of flexibility it can accommodate small changes in size between risers eliminating the need for individual matching of risers and the clamps.

In the illustrated embodiment the axis bars 8 are carried by feet 13 mounted on the half shells 2. Each foot 13 has a first surface 15 generally conforming to the curvature of the half shell 2 and a second surface 15 generally conforming to the curvature of the axis bar 8. If desired the foot 13 can be formed integrally with or

bonded to either or both of the axis bar and the half shell 2. In the illustrated embodiment the foot is made of fibre reinforced plastics material comprising a central core 19 of biaxial chopped mat (800/600). Chopped strand 100 overlying a layer of 1oz CSM strip 16 forms cheeks 17 of the second surface 15. These components are covered with two layers of veil 18.

A retainer is provided. In the illustrated embodiment this comprises a plurality of ribs 11. The ribs extend longitudinally in the illustrated embodiment so that the support is not made too rigid to conform to the riser. The ribs in the illustrated embodiment comprises foamed material coated with fibre reinforced resin.

In order to reduce internal stresses the support may comprise an internal member received in an outer member. The internal members may comprises a gel coat less than 0.5 mm thick backed by one layer of 300g CSM and three layers of 450g CSM. The grooved portion is provided additionally with a 20g tissue layer. The internal member is laid up in mould in conventional manner. As external member comprising a less than 0.5mm gel coat a single layer of 300g CSM one layer of 450g CSM (two in the region of the ribs) a layer of UTILCLOTH 800/600 and a layer of 450g CSM is laid up in a separate mould and united with the inner member later. The end of faces of the ribs comprise 1 layer of 300g CSM and 4 layers of 600g CSM .

Buoyancy material which may be of conventional materials is secured to the retainer. In the illustrated embodiment the buoyancy material has a pocket which receives the clamp and ribs. Conveniently the buoyancy material is in the form of element halves which are strapped or bolted together with the support received in the pocket. Almost all the stresses associated with locating the buoyancy are borne by the support. The buoyancy element itself is primarily subjected to an upward

force generated by its inherent buoyancy. This allows a simpler and quicker installation than that in which the buoyancy module itself is load bearing.

The embodiment of Figure 6 is broadly similar to that hereinbefore discussed. Only some features will be discussed in detail.

The embodiment comprises two half shells 20. Each half shell has an end flange 21, extending part way around the end of the half shell. A lateral flange 22 extends along each edge of the half shell 20. One lateral flange 22 is formed with a male member 23 receivable in a female member 24 of the other half shell 20. Preferably the half shells are identical. A fastener 24 clamps the half shells 20 to the pipe. In the illustrated embodiment this comprises a pair of studs 25 passing through the male and female members. It will be apparent that other fasteners which need not be screw-threaded may be employed. The studs in the illustrated embodiment are of **ZERON** and are passed through spreader plates 26 which in the embodiment are also of **ZERON** which is a corrosion resisting stainless steel.

The end flange 21 comprises a retainer but further retainers in the form of ribs 27 are provided. It will be apparent to the skilled worker that ribs and flanges do not constitute the only retainers. Other possible retainers include bolts passing through lugs. This list is by no means to be construed as limiting; Those skilled in the art will have no difficulty in devising other retainers.

Once the support is clamped to a pipe buoyancy elements are mounted on the support. The pocket in which the support is received can be seen in Figure 6. Dotted line A indicates the inner diameter of the element except in the region of the support and dotted line B indicates the inner diameter of the element in the region of the support. The faces of the pocket bear against the flange and ribs and the element is thus held in place.

Those skilled in the art will have no difficulty in devising modifications.

While the invention has been described by reference to clamping buoyancy to risers it will be apparent that the invention has more general utility. For example insulating ballasting or buoyancy elements can be applied to subsea pipelines. The invention furthermore is not to be construed as limited to subsea use. Land based and subterranean uses will suggest themselves to the skilled.

CLAIMS

1. A support for mounting an item on a pipe the support comprising a sleeve of adjustable internal diameter for securing to the pipe and a retainer for retaining the item to the support.

2. A support as claimed in Claim 1 wherein the sleeve comprises fibre reinforced plastics material.

3. A support as claimed in Claim 2, wherein the sleeve comprises glass fibre reinforced plastics material.

4. A support as claimed in any one of the preceding claims, wherein the internal surface of the sleeve is provided with friction grooves.

5. A support as claimed in Claim 4, wherein the friction grooves comprise a helical thread.

6. A support as claimed in any one of the preceding claims wherein the sleeve comprises two generally semicylindrical half shells.

7. A support as claimed in Claim 6, wherein the joint between the half shells is castellated.

8. A support as claimed in Claim 6 or Claim 7, wherein the half shells are joined by fasteners curved by flanges adjoining the joint.

9. A support as claimed in Claim 6 or Claim 7, wherein the half shells are joined by at least one tension band.

10. A support as claimed in Claim 9, wherein the tension band comprises **KEVLAR** or titanium.

11. A support as claimed in any one the preceding claims wherein the retainer comprises longitudinal ribs on the outer surface of the sleeve.

12. A support as claimed in Claim 11, wherein the ribs comprise a foam core encapsulated by fibre reinforced plastics material.

13. A support as claimed in any one of the preceding claims wherein the item comprises a buoyancy element.

14. A support substantially as hereinbefore described by reference to any one of the figures.

15. A kit of parts comprising a support as claimed in any one of the preceding claims and a buoyancy element.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report) 9	Application number GB 9503302.3
Relevant Technical Fields (i) UK Cl (Ed.N) F2P PA29, PL1 (ii) Int Cl (Ed.6) F16L 1/24, 3/08, 3/10, 3/12, 3/137, 3/14, 3/24, 7/00	Search Examiner MR S WALLER
	Date of completion of Search 19 MAY 1995
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE: WPI	Documents considered relevant following a search in respect of Claims :- 1-15

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	US 4971268	(BOEING) see Figures 1 and 2	1, 6, 7, 9
X	US 4767087	(COMBU) see Figure 1	1, 6, 8
X	US 4631039	(FOLLANSBEE) see Figure 1	1, 6, 13

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